Reflective Mulch in Pistachio Orchards

The use of reflective mulches has achieved success in various aspects of horticultural production, including early fruit ripening, increased crop yield, weed control and pest and disease minimisation.

The use of reflective mulches in orchard systems is also becoming an increasingly popular way to increase light levels into the orchard canopy.

A research project (Zhang, 2011), conducted over seven growing seasons by Dr. Jianlu Zhang, Research Field Officer, Pistachio Growers Association Incorporated, has shown very encouraging results with the use of reflective mulch in pistachio crops at CMV farms at Robinvale, Victoria.

The reflective mulch, Extenday™, is a reflective fabric designed and produced in New Zealand. The Extenday™ fabric is durable and resists traffic, therefore enabling its use for multiple seasons.

In this study, the Extenday™ fabric was placed in the orchard at bud burst and left in position until harvest. The fabric was tethered in place by steel pins, tied to trees, or by having soil placed along the edges of the fabric.

In relation to yield comparisons all yields were fresh yields with the hull. In the return comparisons all prices were based on the price in 2004. Current prices are much better than that.

In the first two years of the study (2004/05 and 2005/06), an increase of between 8 and 19 kg/tree and $49.00/tree occurred when a 4m wide strip of Extenday™ was placed between the tree-rows (inter-row, Figure 1, Table 1).

In year 3 (on-year), Extenday™ led to an increase of 8 kg/tree and $30/tree.

In year 4 (off-year), Extenday™ led to an increase of 4 kg/tree and $10/tree.

This positive outcome led to another question. If the reflective mulch was placed under the tree canopy, would the results be similar or better? Hence, trials over a further 3 years were conducted to answer this question. In year 4, the new trial was started with the reflective mulch in a new position.

![Figure 1: Extenday™ fabric placed between the tree-rows (inter-row)](image)

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<tbody>
<tr>
<td></td>
<td>Yield (kg)</td>
<td>Return ($)</td>
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<td>Yield (kg)</td>
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<tr>
<td>Control</td>
<td>52.0a</td>
<td>120.2</td>
<td>30.88</td>
<td>72.48</td>
<td>47.48</td>
<td>117.5</td>
<td>3.4b</td>
</tr>
<tr>
<td>Extenday™ (inter-rows)</td>
<td>60.1a</td>
<td>142.2</td>
<td><strong>49.6a</strong></td>
<td><strong>121.8a</strong></td>
<td>55.3a</td>
<td><strong>148.9a</strong></td>
<td>7.4a</td>
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<tr>
<td>Extenday™ (under canopy)</td>
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<td>n/a</td>
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<td>n/a</td>
<td>n/a</td>
<td>7.0a</td>
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Table 1: Harvest results showing yield and returns per tree

1 Harvest yields established from two shakes at harvest.
2 For each year, yields within column followed by different small letters are significantly different at P<0.05
3 For each year, yields within column followed by different capital letters are significantly different at P<0.01
In the new trial the 2007/08 season (off-year) produced no significant difference of fresh in-hull yield of pistachios with, or without the Extenday™ reflective mulch (Table 1). However, yields in this year were low irrespective of treatment.

The indications are that the previous trials produced benefits from the use of Extenday™ with the off-years still producing higher yields but in an ‘extreme’ off-year there appears to be no benefit from the use of the reflective mulch.

However, in year 5 of the study (2008/09), a 2m wide strip of Extenday™ was either placed underneath the canopy or a 4m wide strip of Extenday™ on either side of the tree-row (Figure 2), had significantly higher yields and returns per tree than in those trees that had no reflective mulch (Table 1); in short, the yields and returns of Extenday™ treatments were similar irrespective of where the fabric was placed i.e., underneath the tree-canopy or within the inter-row.

In year 6 of the study (2009/10) significantly higher yields and returns occurred where Extenday™ was placed under the tree canopy, in comparison to no reflective mulch, however, Extenday™ placed within the inter-row was not significantly different to the control. (Table 1)

In summary, in two of three years there was a significant increase in crop yield and return when Extenday™ was placed under the tree canopy from budburst to harvest. When Extenday™ was placed in the inter-row, returns were increased in four of the six years. In general all on-year crops with Extenday™ increased yields in comparison with the control.

However, Extenday™ was generally more effective when placed under the tree canopy in comparison to when it was placed in the inter-row.

In this study, incident radiation in the lower canopy of trees with Extenday™ fabric was approximately 11%; in comparison, only 2% occurred in control trees (data not presented). The increase in radiation with Extenday™ fabric compares well with other crops such as apples, cherries, kiwifruit, nectarines, pears, persimmon, plums and grapes (Hanson, 2005). (http://www.extenday.co.uk/publications.html).

Since shading reduces pistachio fruit set, reflected light intensity may be an important factor for increasing crop yield. As trees with Extenday™ reflective fabric had greater light incidence in the lower tree canopy, this may have led to an improvement in nut set and/or the size of the nut. However, the mechanisms that led to increases in crop yields require further investigation.

This study indicates that reflective mulch improves pistachio production in the Sunraysia region of Victoria, Australia. Trials examining the effect of reflective mulch on pistachio yield in other production areas of Australia are warranted.

References: